comprises a shaft, and the speed reducer further comprises an input gear to mesh with the spur gear and connected to the shaft.

7. (NEW) The joint structure of a robot according to claim 6, wherein the speed reducer further comprises:

a casing attached to the first member; and

a rotating member attached to the second member.

8. (NEW) The joint structure of a robot according to claim 7, further comprising wiring or piping, wherein the casing and the rotating member define through holes therein about a common axis, and the wiring or piping passes through the through holes.

9. (NEW) The joint structure of a robot according to claim 8, wherein the motor is connected eccentrically to the second member to allow the wiring or piping to pass through the through holes.

REMARKS

INTRODUCTION:

In accordance with the foregoing, FIGS. 3 and 4 and claims 1-4 have been amended. Claims 5-9 have been added. Claims 1-9 are pending and under consideration.

OBJECTION TO FIGS. 3 AND 4:

FIGS. 3 and 4 have been designated as "PRIOR ART" in the accompanying Letter to the Examiner Requesting Approval of Changes to the Drawings filed concurrently herewith.

OBJECTION TO THE ABSTRACT:

It is respectfully submitted that the attached Substitute Abstract overcomes the objection.

REJECTION UNDER 35 U.S.C. §112:

Claim 3 is rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It is respectfully submitted that the above amendment to claim 3 overcomes the rejection.

REJECTIONS UNDER 35 U.S.C. §102:

Claims 1 and 2 are rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent 4,690,010 to Matsumoto et al.

Independent claim 1 recites "the motor is attached to the second member so that the input gear of the motor is in mesh with the spur gear of the first-stage speed reducing mechanism." Thus, the motor includes a shaft, which drives the input gear, which then drives the spur gear, and the second motor is driven relative to the first member. The motor is attached to the rotating member.

In contrast, Matsumoto et al. discloses that the motor is attached to the stationary member. Specifically, FIG. 9 of this reference illustrates motor 2, attached to first member 71. Motor 2 is connected to second member 73 via speed reducer 70, such that the second member 73 rotates relative to first member 71. Thus, motor 2 is not attached to the rotating member.

Furthermore, using independent claim 1 as an example, this claim recites “a single” spur gear in mesh with the input gear. This differs from Matsumoto et al, which discloses the pinion gear in mesh with three spur gears 25. Col. 6, ln.9-10.

Still further, using independent claim 1 as an example, this claim recites “the motor is attached to the second member with the shaft of the motor shifted with respect to a center of the speed reducer.” It is respectfully submitted that Matsumoto et al. does not disclose these features.

Accordingly, withdrawal of the rejection of claim 1, and claim 2 depending therefrom, is requested.

REJECTIONS UNDER 35 U.S.C. §103:

Claims 3 and 4 are rejected under 35 U.S.C. §103(a) as being unpatentable over Matsumoto et al. in view of U.S. Patent 5,606,235 to Mauletti.

As a preliminary matter, please note that claim 3 depends from claim 1, in accordance with the Preliminary Amendment filed June 8, 2001.

Claim 3 depends from independent claim 1, and is therefore distinguishable from Matsumoto et al. Claim 3 recites "said casing and said rotating member are provided with through holes about a common axis." Mauletti does not disclose through holes about a common axis. Instead, FIG. 7 of this reference illustrates shafts 35, 50 with hollows therein to allow for passage of cables. However, FIG. 7 clearly illustrates that these shafts do not have a common axis. Accordingly, withdrawal of the rejection of claim 3 is requested.

Independent claim 4 recites "a motor fixed to the second member." Accordingly, independent claim 4 is distinguishable from Matsumoto et al. Mauletti does not overcome the deficiencies of Matsumoto et al., and is not relied upon by the Examiner for this purpose. Accordingly, withdrawal of the rejection of independent claim 4 is requested.

NEW CLAIMS:

New independent claim 5 is added and recites "a motor connected to the second member to drive the second member." Accordingly, independent claim 5, and new claims 6-9 depending therefrom, are patentable over the cited references.

CONCLUSION:

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

Date: 10-16-02

By: M. Badagliacca
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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please **AMEND** claims 1-4 as follows:

1. (ONCE AMENDED) A joint structure of a robot, comprising:

a speed reducer;

a first member; [and]

a second member connected to [each other for] the first member through the speed reducer to rotate relative [rotation through a speed reducer] to the first member; and

a motor [for driving] having a shaft, the motor to drive the second member [for rotation] to rotate relative to the first member, wherein

the speed reducer includes a first-stage speed reducing mechanism and a second-stage speed reducing mechanism,

the first-stage speed reducing mechanism includes an input gear connected directly to the shaft of the motor and a single spur gear in mesh with the input gear,

the second-stage speed reducing mechanism includes a crankshaft connected directly to the spur gear, an external gear which engages the crankshaft to be rocked eccentrically, a casing of the speed reducer, an internal gear which is formed inside the casing and is in mesh with the external gear, and a rotating member which supports the crankshaft for rotation and can rotate around the central axis of the internal gear with respect to the casing,

the casing of the second-stage speed reducing mechanism is attached to the first member,

the second member is attached to the rotating member of the second-stage speed reducing mechanism, and

the motor is attached to the second member, with the shaft of the motor shifted with

respect to a center of the speed reducer, so that the input gear of the motor is in mesh with the spur gear of the first-stage speed reducing mechanism.

2. (ONCE AMENDED) The joint structure of a robot according to claim 1, wherein said second member [is provided with] comprises a mounting portion [with mounting] to mount the motor in a given position and is attached to the rotating member axis of the output of the speed reducer, and said second member and said rotating member are configured such that the rotational phase of the second member are configured such that the rotational phase of the second member with respect to the rotating member is settled using a positioning pin when attaching the second member to the rotating member.

3. (THREE TIMES AMENDED) The joint structure of a robot according to claim 1, further comprising wiring or piping, wherein said first and second members of the robot have a hollow structure inside, and said casing and said rotating member are provided with through holes around [their] a common axis so that the wiring or piping is secured inside the joint.

4. (ONCE AMENDED) A joint structure of a robot, comprising:

a speed reducer [including] comprising:

a cylindrical casing,

a rotating member rotatably supported on the casing through a first bearing and having a hollow in the center thereof, and

a gear speed reducing mechanism arranged on the casing for rotation through a second bearing and having a hollow in the center thereof;

a first member fixed to the casing of the speed reducer and having a hollow in the center thereof;

a second member fixed to the rotating member of the speed reducer and having a hollow in the center thereof; and

a motor fixed to the second member so that the output shaft thereof extends in the direction parallel to the central axis of the speed reducer toward the gear speed reducing mechanism of the speed reducer, the motor having a shaft which is shifted with respect to a center of the speed reducer;

wherein a robot joint is constituted between the first member and the second member in a manner such that the gear speed reducing mechanism of the speed reducer is actuated by the rotation respect to the first member.

ABSTRACT OF THE DISCLOSURE

A first member of a robot is fixed to a casing of a speed reducer. A second member is fixed [by fitting] to a rotating member that rotates [relatively] relative to the casing. A motor is mounted on the second member, and an input gear [that is] connected directly to the shaft of the motor [and] meshes with a spur gear of the speed reducer [are made to mesh with each other]. A crankshaft [that] is connected to the spur gear and is rotatably mounted on the rotating member [through a bearing]. As the spur gear and the crankshaft rotate, an external gear rocks eccentrically and rotates for one tooth with respect to an internal gear in the casing. Thereupon, the rotating member rotates relative[ly] to the casing, while the second member rotates [relatively] relative to the first member. [The speed reducer of the invention, compared with a conventional one, requires no use of a center gear, so that it includes fewer components, and therefore, is lower-priced and more reliable.]